

CLAIMS

We claim:

- 5 1. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 5 or SEQ ID NO: 7; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 5 or SEQ ID NO: 7; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the
10 complementary strand of a polynucleotide having SEQ ID NO: 4 or SEQ ID NO: 6; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of UDP-N-acetylmuramoylalanine-D-glutamate ligase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.
- 15 2. The composition of claim 1, wherein at least about two-thirds of the polypeptide in the sample is soluble.
3. The composition of claim 1, wherein the polypeptide is fused to at least one heterologous polypeptide that increases the solubility or stability of the polypeptide.
4. The composition of claim 1, further comprising a matrix suitable for mass
20 spectrometry.
5. The composition of claim 1, wherein the matrix is a nicotinic acid derivative or a cinnamic acid derivative.
6. A composition of claim 1, wherein the polypeptide is enriched in at least one NMR isotope.
- 25 7. The composition of claim 6, wherein the NMR isotope is one of the following: hydrogen-1 (1H), hydrogen-2 (2H), hydrogen-3 (3H), phosphorous-31 (31P), sodium-23 (23Na), nitrogen-14 (14N), nitrogen-15 (15N), carbon-13 (13C) and fluorine-19 (19F).
8. The composition of claim 6, further comprising a deuterium lock solvent.
9. The composition of claim 8, wherein the deuterium lock solvent is one of the
30 following: acetone (CD₃COCD₃), chloroform (CDCl₃), dichloromethane (CD₂Cl₂), methyl nitrile (CD₃CN), benzene (C₆D₆), water (D₂O), diethylether ((CD₃CD₂)₂O), dimethylether ((CD₃)₂O), N,N-dimethylformamide ((CD₃)₂NCDO), dimethyl sulfoxide

(CD₃SOCD₃), ethanol (CD₃CD₂OD), methanol (CD₃OD), tetrahydrofuran (C₄D₈O), toluene (C₆D₅CD₃), pyridine (C₅D₅N) and cyclohexane (C₆H₁₂).

10. The composition of claim 1, wherein the polypeptide is labeled with a heavy atom.

5 11. The composition of claim 10, wherein the heavy atom is one of the following: cobalt, selenium, krypton, bromine, strontium, molybdenum, ruthenium, rhodium, palladium, silver, cadmium, tin, iodine, xenon, barium, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, tantalum, tungsten, rhenium, osmium, iridium, platinum, gold,
10 mercury, thallium, lead, thorium and uranium.

12. The composition of claim 10, wherein the polypeptide is labeled with seleno-methionine.

13. A crystallized, recombinant polypeptide, wherein the polypeptide comprises:
15 (a) an amino acid sequence set forth in SEQ ID NO: 2 or SEQ ID NO: 4; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 2 or SEQ ID NO: 4; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 1 or SEQ ID NO: 3; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of UDP-N-acetylmuramoylalanine-D-glutamate ligase from *S.*
20 *aureus*, and wherein the polypeptide of (a), (b) or (c) is in crystal form.

14. The crystallized, recombinant polypeptide of claim 13, wherein the polypeptide is labeled with a heavy atom.

15. The crystallized, recombinant polypeptide of claim 13, wherein the polypeptide is labeled with seleno-methionine.

25 16. The crystallized, recombinant polypeptide of claim 13, which diffracts x-rays to a resolution of about 3.5 Å or better.

17. A crystallized complex comprising the crystallized, recombinant polypeptide of claim 13 and a co-factor, wherein the complex is in crystal form.

30 18. A crystallized complex comprising the crystallized, recombinant polypeptide of claim 13 and a small organic molecule, wherein the complex is in crystal form.

19. A composition comprising the crystallized, recombinant polypeptide of claim 13 and a cryo-protectant.

20. The composition of claim 19, wherein the cryo-protectant is one of the following: methyl pentanediol, isopropanol, ethylene glycol, glycerol, formate, citrate, mineral oil and a low-molecular-weight polyethylene glycol.

21. A host cell comprising a nucleic acid encoding a polypeptide of claim 1;
 5 wherein a culture of the host cell produces at least about 1 of the polypeptide per liter of culture and the polypeptide is at least about one-third soluble as measured by gel electrophoresis.

22. The composition of claim 1, wherein the polypeptide comprises: (a) an amino acid sequence from 1 to at least about 40 amino acids shorter than the amino acid sequence set forth in SEQ ID NO: 5 or SEQ ID NO: 7; or (b) an amino acid sequence from 1 to at least about 40 amino acids shorter than an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 5 or SEQ ID NO: 7; wherein the polypeptide of (a) or (b) has at least one biological activity of UDP-N-acetylmuramoylalanine-D-glutamate ligase from *S. aureus*; and wherein the polypeptide of
 10 (a) or (b) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

23. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 28 or SEQ ID NO: 30; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 28 or SEQ ID NO: 30; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 27 or SEQ ID NO: 29; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of UDP-N-acetylmuramate-alanine ligase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c)
 20 is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

24. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 47 or SEQ ID NO: 49; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 47 or SEQ ID NO: 49; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 46 or SEQ ID NO: 48; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of UDP-N-
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acetylenolpyruvylglucosamine reductase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

25. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 56 or SEQ ID NO: 58; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 56 or SEQ ID NO: 58; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 55 or SEQ ID NO: 57; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of mevalonate kinase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

26. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 65 or SEQ ID NO: 67; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 65 or SEQ ID NO: 67; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 64 or SEQ ID NO: 66; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of acetyl-CoA carboxylase carboxyl transferase subunit alpha from *E. coli*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

27. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 74 or SEQ ID NO: 76; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 74 or SEQ ID NO: 76; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 73 or SEQ ID NO: 75; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of acetyl-CoA carboxylase carboxyl transferase subunit alpha from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

28. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 83 or SEQ ID NO: 85; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 83 or SEQ ID NO: 85; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 82 or SEQ ID NO: 84; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of phosphoglucosamine-mutase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

29. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 92 or SEQ ID NO: 94; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 92 or SEQ ID NO: 94; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 91 or SEQ ID NO: 93; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of D-alanine-D-alanine ligase A from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

30. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 101 or SEQ ID NO: 103; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 101 or SEQ ID NO: 103; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 100 or SEQ ID NO: 102; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of phosphoglucomutase/phosphomannomutase family protein from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

31. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 120 or SEQ ID NO: 122; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 120 or SEQ ID NO: 122; or (c) an amino acid

sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 119 or SEQ ID NO: 121; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of UDP-N-acetylmuramoylalanine-D-glutamate ligase from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

32. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 140 or SEQ ID NO: 142; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 140 or SEQ ID NO: 142; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 139 or SEQ ID NO: 141; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of methionyl-tRNA synthetase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

33. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 149 or SEQ ID NO: 151; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 149 or SEQ ID NO: 151; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 148 or SEQ ID NO: 150; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of tyrosyl-tRNA synthetase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is purified to essential homogeneity.

34. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 158 or SEQ ID NO: 160; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 158 or SEQ ID NO: 160; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 157 or SEQ ID NO: 159; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of histidyl-tRNA synthetase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

35. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 167 or SEQ ID NO: 169; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 167 or SEQ ID NO: 169; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 166 or SEQ ID NO: 168; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of thymidylate kinase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

36. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 176 or SEQ ID NO: 178; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 176 or SEQ ID NO: 178; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 175 or SEQ ID NO: 177; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of peptide chain release factor RF-1 from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

37. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 185 or SEQ ID NO: 187; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 185 or SEQ ID NO: 187; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 184 or SEQ ID NO: 186; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of histidine tRNA synthetase from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

38. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 194 or SEQ ID NO: 196; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 194 or SEQ ID NO: 196; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 193 or SEQ ID NO: 195;

wherein the polypeptide of (a), (b) or (c) has at least one biological activity of BirA bifunctional protein from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

39. A composition comprising an isolated, recombinant polypeptide, wherein the
5 polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 203 or SEQ ID NO: 205; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 203 or SEQ ID NO: 205; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 202 or SEQ ID NO: 204;
10 wherein the polypeptide of (a), (b) or (c) has at least one biological activity of PTS system enzyme II A component from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

40. A composition comprising an isolated, recombinant polypeptide, wherein the
15 polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 212 or SEQ ID NO: 214; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 212 or SEQ ID NO: 214; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 211 or SEQ ID NO: 213;
20 wherein the polypeptide of (a), (b) or (c) has at least one biological activity of adenine phosphoribosyltransferase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

41. A composition comprising an isolated, recombinant polypeptide, wherein the
25 polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 221 or SEQ ID NO: 223; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 221 or SEQ ID NO: 223; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 220 or SEQ ID NO: 222;
30 wherein the polypeptide of (a), (b) or (c) has at least one biological activity of uridylate kinase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

42. A composition comprising an isolated, recombinant polypeptide comprising: (a) an amino acid sequence set forth in SEQ ID NO: 230 or SEQ ID NO: 232; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 230 or SEQ ID NO: 232; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 229 or SEQ ID NO: 231; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of guanylate kinase from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

43. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 239 or SEQ ID NO: 241; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 239 or SEQ ID NO: 241; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 238 or SEQ ID NO: 240; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of adenine phosphoribosyltransferase from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

44. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 248 or SEQ ID NO: 250; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 248 or SEQ ID NO: 250; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 247 or SEQ ID NO: 249; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of uridylate kinase from *S. pneumoniae*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

45. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 270 or SEQ ID NO: 272; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 270 or SEQ ID NO: 272; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the

complementary strand of a polynucleotide having SEQ ID NO: 269 or SEQ ID NO: 271; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of uridylylate kinase from *P. aeruginosa*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

5 46. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 279 or SEQ ID NO: 281; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 279 or SEQ ID NO: 281; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the
10 complementary strand of a polynucleotide having SEQ ID NO: 278 or SEQ ID NO: 280; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of phosphoglycerate kinase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

 47. A composition comprising an isolated, recombinant polypeptide, wherein the
15 polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 288 or SEQ ID NO: 290; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 288 or SEQ ID NO: 290; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 287 or SEQ ID NO: 289;
20 wherein the polypeptide of (a), (b) or (c) has at least one biological activity of flavoprotein affecting synthesis of DNA and pantothenate from *E. coli*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

 48. A composition comprising an isolated, recombinant polypeptide comprising: (a)
25 an amino acid sequence set forth in SEQ ID NO: 297 or SEQ ID NO: 299; (b) an amino acid sequence having at least about 90% identity with the amino acid sequence set forth in SEQ ID NO: 297 or SEQ ID NO: 299; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 296 or SEQ ID NO: 298; wherein the polypeptide of
30 (a), (b) or (c) has at least one biological activity of riboflavin kinase/FAD synthase from *S. aureus*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

49. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 306 or SEQ ID NO: 308; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 306 or SEQ ID NO: 308; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 305 or SEQ ID NO: 307; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of phosphopantetheine adenylyltransferase from *P. aeruginosa*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.

50. A composition comprising an isolated, recombinant polypeptide, wherein the polypeptide comprises: (a) an amino acid sequence set forth in SEQ ID NO: 315 or SEQ ID NO: 317; (b) an amino acid sequence having at least about 95% identity with the amino acid sequence set forth in SEQ ID NO: 315 or SEQ ID NO: 317; or (c) an amino acid sequence encoded by a polynucleotide that hybridizes under stringent conditions to the complementary strand of a polynucleotide having SEQ ID NO: 314 or SEQ ID NO: 316; wherein the polypeptide of (a), (b) or (c) has at least one biological activity of peptide chain release factor 1 from *P. aeruginosa*; and wherein the polypeptide of (a), (b) or (c) is at least about 95% pure as determined by gel electrophoresis in a sample of the composition.